

WHAT IS CLAIMED IS:

1. A semiconductor device in which an interlevel insulating film formed between a Cu interconnection formed by damascene and an upper metal interconnection layer
5 formed on said Cu interconnection has a multilayered structure made of a Cu diffusion preventive insulating layer and another insulating film, wherein said Cu diffusion preventive insulating layer has a multilayered structure made of not less than two layers.
- 10 2. A device according to claim 1, wherein said Cu diffusion preventive insulating layer is formed by CVD so as to be made up into a multilayered structure made of not less than two layers.
3. A device according to claim 1, wherein said Cu
15 diffusion preventive insulating layer has a multilayered structure made up of a first Cu diffusion preventive insulating film formed by CVD at a temperature of less than 350°C and a second Cu diffusion preventive insulating film formed by CVD at a high temperature of not less than
20 350°C and not more than 450°C.
4. A device according to claim 1, wherein an oxide layer on a Cu surface, which is formed between said Cu diffusion preventive insulating layer and said Cu interconnection, is reduced in order to improve adhesion
25 properties of said Cu diffusion preventive insulating

layer.

5. A device according to claim 2, wherein an oxide layer on a Cu surface, which is formed between said Cu diffusion preventive insulating layer and said Cu interconnection, is reduced in order to improve adhesion properties of said Cu diffusion preventive insulating layer.

6. A device according to claim 3, wherein an oxide layer on a Cu surface, which is formed between said Cu diffusion preventive insulating layer and said Cu interconnection, is reduced in order to improve adhesion properties of said Cu diffusion preventive insulating layer.

7. A device according to claim 3, wherein said first Cu diffusion preventive insulating film is an insulating film not containing O.

8. A device according to claim 7, wherein said first Cu diffusion preventive insulating film not containing O is one film selected from the group consisting of an SiN film, SiC film, SiCN film, and organic film.

9. A device according to claim 3, wherein a dry etching selectivity of said second Cu diffusion preventive insulating film to said interlevel insulating film formed on said second Cu diffusion preventive insulating film is not less than 1 : 10.

10. A semiconductor device manufacturing method of forming an interlevel insulating film into a multilayered structure made of a Cu diffusion preventive layer and another insulating film between a Cu interconnection
5 formed by damascene and an upper metal interconnection layer on said Cu interconnection, comprising forming at least two stacked Cu diffusion preventive insulating layers as said Cu diffusion preventive layer.

11. A method according to claim 10, wherein said Cu
10 diffusion preventive layer is formed into at least two stacked layers by CVD.

12. A method according to claim 10, wherein said Cu diffusion preventive layer is formed by forming a first Cu diffusion preventive insulating film by CVD at a low
15 temperature of less than 350°C, and forming a second Cu diffusion preventive insulating film by CVD at a high temperature of not less than 350°C and not more than 450°C.

13. A method according to claim 10, wherein said Cu diffusion preventive layer forming step comprises reducing
20 a Cu oxide layer formed on said Cu interconnection and forming said Cu diffusion preventive layer in order to improve adhesion properties of said Cu diffusion preventive insulating layer.

14. A method according to claim 11, wherein said Cu
25 diffusion preventive layer forming step comprises reducing

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a Cu oxide layer formed on said Cu interconnection and forming said Cu diffusion preventive layer in order to improve adhesion properties of said Cu diffusion preventive insulating layer.

- 5 15. A method according to claim 12, wherein said Cu diffusion preventive layer forming step comprises reducing a Cu oxide layer formed on said Cu interconnection and forming said Cu diffusion preventive layer in order to improve adhesion properties of said Cu diffusion preventive insulating layer.
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